

Effects of detergent shock loads on anaerobic granular sludge morphology and methanogenic activity

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Two shock loads of a detergent (shock 1 with 0.15 gCOD/L during 56 h, and shock 2 with 0.30 gCOD/L during 222 h) were applied in a lab-scale EGSB reactor with 1.5 gCOD/L of ethanol. Quantitative image analysis and methanogenic activity measurements were used to characterize the surfactant effects.

The COD removal efficiency was unaffected with 0.15 g/L of detergent. However, 88 h after exposure to 0.30 g/L of detergent the COD removal efficiency decreased drastically.

In the first 8h of operation of shock 1, the specific methanogenic activity (SMA) was slightly stimulated and decreased afterwards, being recovered 5 days after the end of exposure time. Concerning the shock 2, the SMA was immediately and persistently reduced during the exposure time. Although, the SMA in the presence of H_2/CO_2 and ethanol were recovered, no improvement was detected in the SMA in the presence of acetate and propionate through the recovery phase. Acetoclastic bacteria are more sensitive to the toxic effects of surfactant, and, the effects are dependent of surfactant concentration and exposure time.

The dynamic evolution of filaments length, aggregates area and aggregates density were well defined by the image analysis descriptors. The ratio filament length / total aggregate area proved to be a good washout early warning indicator, once it increased 3 and 5 days before effluent volatile suspended solids, respectively in shock load 1 and 2.

KEY words: anaerobic granular sludge; methanogenic activity; image analysis; detergent; surfactant.

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